

REMARKS

I. Introduction

In response to the Office Action dated August 6, 2004, claims 16 and 17 have been canceled, claims 1-4, 7-11 and 14-15 have been amended, and new claims 18-66 have been added. Claims 1-15 and 18-66 are in the application. Re-examination and re-consideration of the application, as amended, is requested.

II. Claim Amendments

Applicants' attorney has made amendments to the claims as indicated above. These amendments were made solely for the purpose of clarifying the language of the claim, and were not required for patentability or to distinguish the claim over the prior art.

Specifically, claims 1-4, 7-11 and 14-15 were amended to remove reference numbers and other artifacts of PCT practice. Claim 16 was canceled without prejudice. Claim 17 was canceled and a revised version was added as new claim 33, so that new claims 18-32, which are apparatus counterparts to original claims 1-15, could be grouped immediately following claims 1-15. New claims 34-35 include revised limitations originally found in claim 17. New claims 36-38 are counterparts to original claims 2-4, except that they are dependent on claim 33. New claims 40-49 are counterparts to original claims 5-12 and 13-49, except that they are dependent on claim 33. New claims 50-66 are apparatus counterparts to claims 33-49.

III. Specification Objections

The specification was objected to as not containing an Abstract.

Applicants' attorney respectfully traverses this objection, by noting that the PCT application filed as the above-identified national stage application included an Abstract on its front page. Nonetheless, Applicants' attorney is submitting a substitute Abstract page herewith.

IV. Prior Art Rejections

A. The Office Action Rejections

On page (2), paragraphs (1)-(2) of the Office Action, claims 1, 2, 8, 9, 10, 11, 12, and 13 were rejected under 35 U.S.C. §102(e) as being anticipated by Franson, U.S. Patent No. 6,678,450 (Franson). On page (3), paragraphs (1)-(2) of the Office Action, claims 3-7 and 14-15

were rejected under 35 U.S.C. §103(a) as being unpatentable over Franson as applied to claim 1, and further in view of Devoe, U.S. Patent No. 5,793,091 (Devoe). On page (4), line (3) of the Office Action, claim 17 was rejected under 35 U.S.C. §103(a) as being unpatentable over Franson in view of Devoe. On page (5), paragraphs (1)-(2) of the Office Action, claim 16 was rejected under 35 U.S.C. §102(b) as being anticipated by Devoe.

Applicants' attorney respectfully traverses these rejections.

B. The Applicants' Claims

Applicants' claims are generally directed to quantum computation with semiconductor quantum dots.

C. The Franson Reference

Franson describes an optical method for quantum computing that makes use of nonlocal effects to construct the quantum gates themselves. A nonlocal interaction in which pairs of atoms interchange two photons produces a large nonlinear phase shift. These nonlinear phase shifts are used to construct quantum logic gates, such as a Controlled-NOT.

D. The Devoe Reference

Devoe describes a parallel architecture of quantum logic gates and quantum communication channels for a quantum computer, thereby achieving advantageous efficiency and computation speed. The architecture of the invention enables parallel memory operations on large quantum words, and permits the application, to the quantum case, of parallel algorithms for mathematical operations such as addition and multiplication. The invention also includes a novel apparatus for realizing parallel architecture using an array of miniature elliptical ion traps, with as many traps as there are bits in a quantum word. The ion trap array preferably uses an elliptical planar geometry, which can be microfabricated by photolithography. Quantum information is transferred from one ion trap to another by either an optical coupling via a high finesse resonant cavity (photon coupling) or by electrostatic coupling of the ions' mechanical motion (phonon coupling).

E. The Applicants' Invention is Patentable Over the References

The Applicants' invention, as recited in independent claims 1, 18, 33 and 48, is patentable over the references, because it contains limitations not taught by the references.

Specifically, neither reference teaches or suggests semiconductor quantum bits, wherein the semiconductor quantum bit comprises a quantum dot. Moreover, neither reference teaches or suggests coherently coupling semiconductor quantum bits using a cavity with an electromagnetic field.

Instead, Franson stores quantum information stored in light, not semiconductor quantum bits. For example, Franson discloses an optical method of quantum computing, using photons, optical media such as atomic vapor cells, interferometers, optical fibers, crystals, etc. However, nowhere does Franson describe semiconductor quantum bits.

Likewise, Devoe describes quantum information stored in ion traps, not semiconductor quantum bits. For example, Devoe discloses that quantum information is transferred from one ion trap to another by either an optical coupling via a high finesse resonant cavity (photon coupling) or by electrostatic coupling of the ions' mechanical motion (phonon coupling). However, nowhere does Devoe describe semiconductor quantum bits.

Thus, Franson and Devoe, taken individually or in combination, does not anticipate or render obvious Applicants' invention. Moreover, the various elements of Applicants' claimed invention together provide operational advantages over Franson and Devoe. In addition, Applicants' invention solves problems not recognized by Franson and Devoe.

Thus, Applicants' attorney submits that independent claims 1, 18, 33 and 50 are allowable over the references. Further, dependent claims 2-15, 19-32, 34-49 and 51-66 are submitted to be allowable over the references in the same manner, because they are dependent on independent claims 1, 18, 33 and 50, respectively, and thus contain all the limitations of the independent claims. In addition, dependent claims 2-15, 19-32, 34-49 and 51-66 recite additional novel elements not shown by the references.

V. Conclusion

In view of the above, it is submitted that this application is now in good order for allowance and such allowance is respectfully solicited.

Should the Examiner believe minor matters still remain that can be resolved in a telephone interview, the Examiner is urged to call Applicants' undersigned attorney.

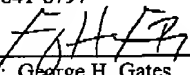
Respectfully submitted,

GATES & COOPER LLP
Attorneys for Applicants

Howard Hughes Center
6701 Center Drive West, Suite 1050
Los Angeles, California 90045
(310) 641-8797

Date: December 10, 2004

GHG/amb

By: 
Name: George H. Gates
Reg. No.: 33,500